

The Rhopalocera of Santa Cruz Island, California¹

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Abstract.—Surveys of Santa Cruz Island in April, May and June of 1966 recorded 27 species of butterflies. Records from other surveys add another 6, for a total of 33 species. This is less than half the number that would be found in comparable habitats on the adjacent mainland at the same times of year. Only one endemic subspecies was found, all others being well documented on the mainland. Several species were present in much greater numbers than usually noted in coastal California, probably due to lack of competition. Other species of ubiquitous or very common occurrence on the mainland were not found at all on the island. This correlates with other offshore islands having varying degrees of faunal reduction, often depending upon their isolation from continental land masses. In addition, the *native* flora and fauna on S.C.I. may be due to the abundance of domestic and feral animals, combined with the introduction of European-type weeds.

Introduction

Santa Cruz Island, Santa Barbara County, California, was surveyed for insects of all Orders from 25 April to 2 May 1966 and again from 7 to 10 June 1966, by the California Insect Survey, University of California, Berkeley. The April-May trip included Jerry A. Powell, Paul Rude, Joe Wolf and RLL. The June trip consisted of only JAP and RLL. In addition, this paper includes records from surveys by Charles L. Remington (CR); Paul A. Opler and Jerry A. Powell (O & P), 14-16 March 1969; David B. Weissman (DW), 1 Aug. 1969; and Glenn A. Gorelick (GG), 23-30 June 1978. Scott E. Miller, Santa Barbara Museum of Natural History, contributed data from his island research.

The overall program of the 1966 surveys was to sample all Insecta and some related arthropods on the island. The Lepidoptera herein treated represent only one phase of the total survey. Since many of the species are closely associated with certain hosts and particular habitats, these situations were sought out during these periods.

The vast majority of the spring annuals, shrubs and trees are the same species found in coastal Santa Barbara and Ventura Counties, as would be expected. Just a few insular endemic plant species were noted. Of

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these, primarily three were examined extensively for Rhopalocera: Catalina Ironwood, *Lyonothamnus floribundus* (Rosaceae); Saint Catherine's Lace, *Eriogonum giganteum*; and Channel Buckwheat, *E. arborescens* (Polygonaceae). Although some butterflies visited these for nectar, none seemed to be associated with them as obligate larval hosts. In the 1978 survey, Nymphalidae ova and larvae were found on introduced *Lavatera assurgentiflora* (Malvaceae), endemic to other northern Channel Islands, and larvae on the more widespread *Baccharis plummerae* (Compositae).

In the following species treatment, the food-plants are only mentioned where considered significant. The hosts of the Rhopalocera (whether present or absent on S.C.I.) of southern California are recorded by Emmel & Emmel (1973).

Fifteen separate localities were surveyed on the island in 1966 — a few only once or twice and the more productive areas many times. Attempts were made to visit all accessible areas from the west end to the east, shorelines, canyons, streams, hillsides, ridges, disturbed fields and waste-weedy situations.

List of species

HESPERIIDAE: Hesperinae

1. *Ochlodes s. sylvanoides* (Boisduval): A most unusual event was finding this skipper in spring flight. First taken on 30 April at Christi Beach, it was quite common throughout the island in early June 1966. In mainland California this species is generally a midsummer flyer, increasing in numbers by early autumn. Fresh specimens were also found at the more "usual" time of 1 Aug. 1969 (DW), but the flight had ceased by late Sept. 1978, a time of abundance on the mainland (JAP).

2. *Polites s. sabuleti* (Boisduval): Quite scarce on the island — one taken 2 mi. east of Christi Ranch and another at Christi Beach on 30 April 1966. The most characteristic habitats on the mainland are sandy areas near the coast, the flight period being April to September (Emmel & Emmel, 1973), and it can become common in urban and waste-weedy areas, with personal records from March to November.

HESPERIIDAE: Pyrginae

3. *Erynnis t. tristis* (Boisduval): Appeared to be generally scarce, but possibly an artifact of sampling. Ridges and higher points were not surveyed as frequently, and this species is often a hilltopper. It was taken sparingly in April, May and June 1966 at scattered locales. The species was quite common in late June 1978 (GG), and a single ♂ was taken late

as 1 Aug. 1969 (DW). The abundance of *E. tristis* on S.C.I. is similar to the Coast Ranges of California, and the dates are encompassed by the March to Sept. flight of this multivoltine species.

PAPILIONIDAE

4. *Papilio z. zelicaon* (Lucas): Rather scarce on S.C.I. in 1966 compared to lowland California. It was found along Albert's Ridge, 27 April, the ridge south of Chinese Harbor and along Prisoner's Harbor Creek, 9 June 1966. However, it was common by late June 1978 (GG), with larvae and pupae abundant on *Foeniculum vulgare* (Umbelliferae). Several adults on S.C.I., 1 Aug. 1969 (DW).

5. *Papilio eurymedon* (Lucas): Found throughout the island, April, May and June 1966 — on hilltops, ridges and along streams. It was very common and widespread in late June 1978 (GG), and still in flight by early Aug. 1969 (DW). It seems to occur in about the same numbers and habitats as on the mainland during the same time periods.

PIERIDAE

6. *Pieris p. protodice* Boisduval & Leconte: Only two males were taken — in a field of mustard, Upper Central Valley on 8 June 1966. This highly vagile species was expected in greater numbers. By late June 1978 it was more common, but not everywhere on the island (GG). In some seasons, *P. protodice* can become very common in most of California, and occurs in much of the continental United States.

7. *Pieris rapae* (Linnaeus): Although not found in the 1966 surveys, it was taken on 1 Aug. 1969 (DW), and in late June 1978 it was not scarce at all in the Central Valley (GG). *P. rapae* can be in adult flight every month of the year in southern California. It was introduced into Quebec, Canada from Europe in about 1860. It is now present in the Hawaiian Islands and many other islands of the Pacific (Howe, 1975). It was introduced accidentally to New Zealand in 1930, and to Australia in 1939 (Common & Waterhouse, 1972).

8. *Colias e. eurytheme* Boisduval: Present in April, May and June 1966, but relatively scarce on the island. April examples included the early spring phenotype "ariadne" Edwards. Two males were taken on S.C.I. on 1 Aug. 1969 (DW). On the mainland, *C. eurytheme* can become extremely common, increasing from spring into autumn.

9. *Colias harfordii* Henry Edwards: Although not found in 1966, it was very common in parts of S.C.I., especially the Coches Prietos area, late June 1978 (GG). One mature larva was on *Lotus scoparius* (Leguminosae), Ridge Road near Upper Laguna Canyon (GG). This

species is found in cismontane southern California from San Diego to Kern Counties, but does not go much north of Santa Barbara County in the Coast Range (Emmel & Emmel, 1973).

10. *Anthocharis sara gunderi* Ingham: This was the only endemic found on Santa Cruz Island. It was extremely abundant in April and May 1966, mostly at Prisoner's Harbor, Prisoner's Harbor Creek and in the Central Valley. At times *gunderi* was much more common than one would find *A. sara* Lucas (or spring form "reakirtii" Edwards) at a single time or place on the mainland. Adults were again taken 14-16 March 1969 (O & P), generally along Prisoner's Harbor Creek.

LYCAENIDAE: Theclinae

11. *Satyrrium s. saepium* (Boisduval): Earliest in the season on Albert's Ridge, 27 April 1966, and by June distributed both along ridges and the lowland areas. It was very common along Ridge Road, late June 1978 (GG). This species was in comparable numbers and habitats as in the chaparral areas of California.

12. *Callophrys d. dumetorum* (Boisduval): Near the end of its flight period, a few worn females were taken in April 1966 — Upper Central Valley, Canada Cervada and Prisoner's Harbor. Fresher examples were found along Prisoner's Harbor Creek, 14-16 March 1969 (O & P). This hair-streak is univoltine with a relatively short flight period. Throughout its extensive range in California, most records are in March and early April (Gorelick, 1971; Langston, 1975).

13. *Strymon melinus pudica* (Henry Edwards): Generally distributed on the island and more common in 1966 and 1978 than usually found in most parts of the western United States. Adults were in flight by mid-March 1969 (O & P), and still present by early Aug. 1969 (DW). *S. melinus pudica* was very common everywhere on S.C.I. in late June 1978 (GG), with numerous hosts noted. Perhaps its abundance on the northern Channel Islands may have prevented by competitive exclusion the establishment of *Strymon avalona* (Wright), known only from Santa Catalina Island (Emmel & Emmel, 1973).

LYCAENIDAE: Lycaeninae

14. *Lycaena helloides* (Boisduval): A single ♀ on deposit in the Natural History, 1 Aug. 1969 (DW) are the early examples from S.C.I. At Prisoner's Harbor, 7 ♂♂ & 5 ♀♀ were taken by Powell, 25, 29 Sept. 1978. This copper is widely distributed through much of the western U. S., including cismontane southern California. However, it has recently become scarce in much of southern California due to habitat destruction by urbanization (Emmel & Emmel, 1973).

LYCAENIDAE, Plebejinae

15. *Brephidium exilis* (Boisduval): Early specimens at Valley Anchorage on 27 April, and at Christi Beach, 30 April 1966. It was in greater numbers by 9 June in Eagle Canyon. It was found again in early Aug. 1969 (DW), and very common in late June 1978 at Coches Prietos Harbor (GG). *B. exilis* was in about the same habitats as in lowland California, its numbers increasing from spring into summer. First found on Oahu, Hawaii, in the summer of 1978 (Riotte & Uchida, 1979).

16. *Leptotes marina* (Reakirt): Two ♀♀ were taken at Prisoner's Harbor on 10 June 1966. This blue can be abundant in urban areas and lower canyons of southern California, especially in summer and fall. It could become more numerous on S.C.I. later in the season with numerous legumes as suitable hosts.

17. *Plebejus a. acmon* (Westwood & Hewitson): In April, May and June 1966 only eight specimens were taken at three separate locations on S.C.I. Some were nectaring on the endemics *Eriogonum giganteum* and *E. arborescens*, but not particularly attracted to these large buckwheats in relation to legumes and other plants in the areas. This multivoltine species was found from mid-March 1969 (O & P) to early Aug. 1969 (DW). It was very abundant in late June 1978 (GG), especially on the south side of S.C.I. near the coast. *P. acmon* can be very common in similar habitats throughout the western U.S.

18. *Everes amyntula* (Boisduval): Both sexes were very abundant at several places on the island, April, May and June 1966. It has been found in good numbers at other seasons (CR), but in some seasons (1969, 1978) none were observed. It is possible that wide fluctuations may occur in the island populations. Although distributed throughout the Pacific States (Downey in Howe, 1975), *E. amyntula* is seldom found in such vast numbers as on Santa Cruz Island in 1966.

19. *Glaucopsyche lygdamus australis* Grinnell: Near the end of its flight period, only four were taken on S.C.I. in April 1966 at Upper Central Valley, Cañada Cervada and Prisoner's Harbor. It was also found along Prisoner's Harbor Creek, mid-March 1969 (O & P). This univoltine spring-flier can become rather common in cismontane southern California and Baja California, Mexico (Langston, 1969).

20. *Celastrina argiolus echo* (Edwards): Generally distributed both along ridges and the lowland stream areas in 1966. A few adults were observed around Catalina Ironwood, but not significantly more than around other trees and shrubs. A single late-flying ♀ was taken 1 Aug.

1969 (DW). It was very common and widespread in late June 1978 (GG). This blue was in about the same numbers and situations as found in mainland California.

NYMPHALIDAE

21. *Adelpha bredowii californica* (Butler): Although the Coast Live Oak is abundant on the island, only three *Adelpha* were collected in 1966, with very few others observed — late April and early June at Prisoner's Harbor and the Central Valley. It was more common in late June 1978, Prisoner's Harbor Creek (GG), and worn by early Aug. 1969 (DW). Its scarcity in the spring is not considered significant as there are wide areas in California where it is uncommon at this time of year.

22. *Vanessa atalanta rubria* (Fruhstorfer): Noted in the Upper Central Valley and at Prisoner's Harbor in April, May and June 1966. Only a few around Prisoner's Harbor, late June 1978 (GG). It was not found in other parts of the island. Although scarce, its numbers were typical of many areas in the Northern Hemisphere. It has been introduced to the Hawaiian Islands, with the nominate *atalanta* established in New Zealand (Clench *in* Howe, 1975).

23. *Cynthia virginiensis* (Drury): Of all the VANESSINAE, this one was by far the most abundant. It was more common at Prisoner's Harbor and the Central Valley in April, May and June 1966 than usually found in most areas of California. Present in Aug. 1969 (DW), and extremely common everywhere on S.C.I., late June 1978 (GG), with larvae found on *Gnaphalium* (Compositae). Wide-ranging in the Americas, *C. virginiensis* has become naturalized on the Hawaiian Islands (Clench *in* Howe, 1975).

24. *Cynthia cardui* (Linnaeus): A very fresh ♀ (indicating a resident breeding population) was taken in the Upper Central Valley on 26 April. It was also found at Christi Beach on 30 April, and Prisoner's Harbor, 1 May 1966. This species was scarce in late June 1978 (GG), with just a few seen in the Central Valley. Its numbers were about the same as would be expected in California in non-migratory seasons. *C. cardui* is now known in Hawaii, Malaysia, Java, and Sumatra as part of its almost worldwide distribution (Clench *in* Howe, 1975).

25. *Cynthia annabella* Field: Taken in the Upper Central Valley in April 1966. Found in mid-March 1969, Prisoner's Harbor Creek (O & P), and early Aug. 1969 on S.C.I. (DW). It was fairly common between Prisoner's Harbor and the U.C. Field Station, late June 1978 (GG), with ova and larvae on cultivated *Lavatera assurgentiflora* (Malvaceae).

C. annabella is common in much of California, with adult records all months of the year.

26. *Junonia coenia* (Hubner): A single ♀ was collected in a waste-weedy area near Prisoner's Harbor on 1 May 1966. However, very common all over the island, late June 1978 (GG). *J. coenia* is often common in lowland southern to northern California, with adult records every month of the year.

27. *Nymphalis antiopa* (Linnaeus): A single ♀ in the Santa Barbara Museum of Natural History was taken at the mouth of Cañada Islay, 11 May 1970 (DW). *N. antiopa* occurs throughout the Holarctic Region. In the Western Hemisphere it ranges from Alaska to Venezuela (Gorelick in Howe, 1975).

28. *Chlosyne gabbii* (Behr): Common at several localities in the central and eastern parts of the island — April, May and June 1966. On some days along Prisoner's Harbor Creek and the Central Valley it was extremely abundant, patrolling along streams and washes, and nectaring on many types of flowers, especially *Baccharis plummerae* (Compositae). Adults were in flight as early as 14-16 March 1969 (O&P), along Prisoner's Harbor Creek; very common as late as 23-30 June 1978 (GG) in the Central Valley. Gorelick also took a few larvae near Prisoner's Harbor on *B. plummerae* — a new host since Emmel & Emmel (1973). *C. gabbii* was much more numerous than ever observed by me in southern or central California.

29. *Euphydryas c. chalcedona* (Doubleday): One of its preferred food-plants, *Diplacus* (Scrophulariaceae), was growing throughout much of the island. However, only five *E. chalcedona* were taken — as singletons at five separate localities, late April and early May 1966. In other seasons it has been found abundantly on S.C.I., as it occurs in much of California where it is found in very large numbers and easily netted.

30. *Speyeria callippe comstocki* (Gunder): On a knoll south of Chinese Harbor two fresh ♂♂ were taken and two more observed on 9 June 1966. Two ♂♂ and 2 ♀♀ were found again on the same hilltop, 28 June 1978 (GG). Possibly this species is scarce or restricted to just one or a few colonies on S.C.I. In comparison to mainland southern California, this correlates as there are many areas where it is not found, and others where it can be rather common.

DANAIDAE

31. *Danaus p. plexippus* (Linnaeus): Worn hibernants were in the Prisoner's Harbor area on 1 May and 9 June 1966. Fresh adults, both

sexes in late June 1978 (GG), mostly in the Central Valley, with larvae on *Asclepias fascicularis* near Prisoner's Harbor. The breeding populations on S.C.I. were probably initiated from "fly-overs." *D. plexippus* has gradually extended its range across the Pacific Ocean from North America. In the Hawaiian Islands it can be very abundant (Langston, 1979), and it is said to have reached Australia first about 1870 (Common & Waterhouse, 1972).

SATYRIDAE

32. *Cercyonis sthenele silvestris* (Edwards): The populations on S.C.I. differ from the *silvestris* of cismontane southern California sufficiently that they probably warrant a name (Remington, 1978). These more whitish "sthenele-type" were initially found near the west end of S.C.I. (CR). Taken 1 Aug. 1969 (DW), and on 27, 29 June 1978 it was found further east on the island (GG). Common: 1) on trail from U.C. Field Station to Ridge Rd.; 2) along Ridge Rd. on south side of island; 3) above Coches Prietos Harbor on the south side; and 4) occasional 1-2 mi. east of the Field Station in the Central Valley (GG). Although phenotypically different, its numbers and flight period compares to *silvestris* in much of coastal southern to northern California.

Additional species in California

Several species of Rhopalocera known commonly in Los Angeles, Ventura and Santa Barbara Counties, California were not found on Santa Cruz Island in the 1966, 1969 and 1978 surveys. Their absence was notable as some can be very much in evidence not only in California, but the entire western United States and/or the North Temperate Zone in general.

HESPERIIDAE

Ochlodes a. agricola (Boisduval) was taken in Santa Barbara County two days before the April 1966 trip to S.C.I. This species was expected in the spring on the island rather than *O. sylvanoides* which normally flies on the mainland in summer and fall. ²Several specimens were taken 26-29 Sept. 1978 at four separate localities by J. A. Powell & Marion E. Buegler. With the addition of *albescens*, 33 species are known from S.C.I. at latest count. *Pyrgus communis albescens* (Plotz) is especially common in the lowlands of California, particularly in disturbed areas, with captures recorded every month of the year. A black-fringed dusky-wing, such as *Erynnis propertius* (Scudder & Burgess) was not observed. Live Oak trees were plentiful, and the single brood adults of *propertius* are in flight from March to June.

² Several specimens were taken 26-29 Sept. 1978 at four separate localities by J. A. Powell & Marion E. Buegler. With the addition of *albescens*, 33 species are known from S.C.I. at latest count.

PAPILIONIDAE

Papilio r. rutulus Lucas is large and conspicuous, and would certainly be noticed on S.C.I. if present. It is common along streams, city parks and urban areas in California and much of the western United States. March to September is the usual flight period in coastal lowland California.

PIERIDAE

Colias eurydice Boisduval has not been found on S.C.I., although this fast-flier is found in the foothills and canyons from northern to southern California. A subspecies of *Anthocaris cethura* could be expected on the northern Channel Islands, as a correlation with the endemic *A. cethura catalina* Meadows known only from Santa Catalina Island, Los Angeles County.

RIODINIDAE

No examples of Riodinidae were found on S.C.I. The most logical candidate would be *Apodemia mormo virgulti* (Behr), which is found throughout the chaparral zones of cismontane southern California both in the spring and late summer to fall. Although several species of *Eriogonum* were present, its preferred host, *E. fasciculatum* was not observed on the island.

LYCAENIDAE

Within the Subfamily THECLINAE, several species of hair-streaks would be possible. Three species of theclines (one in great abundance) were actually present. *Incisalia augustinus iroides* (Boisduval) could be expected in the early spring, and *Satyrium s. sylvinus* (Boisduval) in late spring and summer.

Only one species of the Subfamily LYCAENINAE was present. Judging by presence of hosts and times of year, at least two more were expected: *Lycaena gorgon* (Boisduval) and *L. x. xanthoides* (Boisduval).

The Subfamily PLEBEJINAE was well represented on S.C.I. — six species in six separate genera. Searches were made for one in a seventh genus. *Euphilotes battoides bernardino* (Barnes & McDunnough) was collected in Ventura County the day before the April 1966 trip to S.C.I., and in Santa Barbara County the day before the June 1966 trip. Two species of large shrub-type *Eriogonum* were growing on the island, but its preferred host, *E. fasciculatum*, was not observed. This blue is common and well distributed in cismontane southern California (Shields, 1977; Langston, 1965, map 1). *Plebejus icarioides evius*

(Boisduval) can be common in mainland Santa Barbara County and generally in the mountains of southern California, with adults from May to July.

NYMPHALIDAE

Limenitis l. lorquini (Boisduval) and *Polygonia s. satyrus* (Edwards) were not found in the canyons or stream areas, even though willows and nettles were present in several parts of S.C.I. *Phyciodes m. mylitta* (Edwards) is found from British Columbia to Baja California. It is multivoltine at the lower elevations. In coastal lowland California *P. mylitta* is found in many habitats from early spring into late autumn. A subspecies of *Euphydryas editha* (Boisduval) occurs on Santa Rosa Island in the absence of *E. chalcona* (Emmel & Emmel, 1975; S. Miller, per. com.). The nominate *editha* and at least three subspecies are known from central and southern California (Emmel & Emmel, 1973), but nothing in this complex recorded from S.C.I.

SATYRIDAE

Coenonympha c. californica Westwood was surprisingly absent from Santa Cruz Island. This ubiquitous species is often abundant on grassy hillsides of coastal California from February to October.

Discussion and Summary

Based upon surveys of Santa Cruz island, Santa Barbara County, California [1939, 1966, 1967, 1970 & 1978], fewer species of Rhopalocera were found than would be expected. With at least token surveys from essentially mid-March to late Sept. (although in different years), it appears the maximum number of possible species have been recorded. In comparison to mainland California (with emphasis on Los Angeles, Ventura and Santa Barbara Counties) this includes the adult flight periods of almost all of the univoltine species. Surveying earlier in the spring would possibly be hampered by inclement weather, and it would be too early for many of the species to emerge as adults. Conditions became quite dry by August, at which time the adult flight of most of the univoltine species has already ceased.

A total of 33 species were collected and observed in six different years, including the extremes of 14 March and 1 Aug. in a single season (1969). At least five species were found in greater numbers on Santa Cruz Island than on the mainland under comparable habitats during the same time periods. These were: *Anthocaris sara gunderi*, *Strymon melinus pudica*, *Everes amyntula*, *Cynthia virginiensis* and the very numerous *Chlosyne gabbii*.

The only endemic, *A. sara gunderi*, was extremely abundant in April and May 1966. The remaining 32 taxa are all well documented in Santa Barbara and Ventura Counties. Most are widespread throughout California, with many ranging in the western United States, and a few being Nearctic or even Holarctic.

A surprising occurrence was the spring flight of *Ochlodes sylvanoides*. First taken on 30 April 1966, it was quite common throughout the island by early June. In a different season, 1969, fresh examples were found in early August, whereas not flying in late Sept. 1978 when common on the mainland.

The most notable species that are apparently absent from Santa Cruz Island are *Papilio rutulus*, *Incisalia augustinus iroides*, *Limenitis lorquini*, *Phyciodes mylitta* and *Coenonympha californica*.

The lack of certain species appears to be due to its being an island *per se*, combined with overgrazing by both cattle and feral goats. Wide areas of the island are somewhat barren of native vegetation. Other parts have been fenced off and the flora seems to be recovering. Weedy annual and perennial plants have invaded some locales, especially the grazed areas. In instances where they outcompete the native plants, this would tend to eliminate or reduce any endemic Lepidoptera that may have been present in the past. On the other hand, this phenomenon would favor such butterflies as *Papilio zelicaon*, *Pieris rapae*, *Cynthia annabella* and *Junonia coenia*.

Several species on Santa Cruz Island also occur in the Hawaiian Islands, with some ranging across the Pacific Ocean as far as Australia, New Zealand and the Orient. These comparisons were made as the more isolated islands have fewer species, as would be expected. For example, the entire Hawaiian chain has only 15 species of Rhopalocera — 2 endemics, 13 imports (Langston, 1979; Riotte & Uchida, 1979). Santa Cruz Island (with 33 species) and the Channel Islands in general, being just offshore from a continental land mass have a much richer fauna than these isolated islands — but still less than half the number on the relatively close mainland.

Editors Note:

Reference to *A. sara gunderi* is open to interpretation. Langston (*in litt.*) recognizes the applicability of *gunderi* based upon Emmel and Emmel (1973 *op. cit.*). Use of *gunderi* in the paper is solely dependent on the Emmel and Emmel reference. In the meantime John Emmel examined SCI specimens and agreed they were best referred to ssp. *reakirtii*. Langston (*in litt.*) concurs with the concept, in addition to a reviewer and the editor. The S.C.I. specimens can

not be easily confused with *gunderi* and appear superficially identical with *reakirtii*. The statements about "endemism" of "*A. sara gunderi*" are therefore open to question on the opinion of all concerned.

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